Chapter 1
Introduction

1-1. References

References pertaining to this manual are listed in Appendix A. Additional reference materials pertaining to the subject matter addressed in this manual are also included in Appendix A.

1-2. General Considerations

The safety and satisfactory performance of earth and rock-fill dams require competent and adequate supervision, careful inspection, and control testing. It is the responsibility of the Resident Engineer to bring to the attention of the Engineering Division any design or construction detail not adequately covered by the plans and specifications. The Resident Engineer must provide the field supervision and control required to accomplish the intent of the plans and specifications. The resident engineer must also coordinate the work with design engineers and provide guidance to the contractor if unexpected conditions are discovered during construction.

a. Importance of construction control. Many earth and rock-fill dams have shown signs of distress or experienced partial failure (necessitating expensive remedial measures) from causes traceable to poor construction practices or to unexpected adverse conditions. Close observations by soils engineers and geologists of foundation and abutment preparation, excavation, fill operations, movements and deformations of fill and foundation, and seepage can often enable early detection and correction of undesirable conditions. Construction control should ensure that:

(1) Necessary actions are taken to remedy or allow for unexpected conditions. Frequent and careful observations by inspectors, geologists, and field engineers, who are familiar with conditions assumed for design, are essential during stripping of the foundation, opening of borrow areas, and excavating operations. Immediate reporting of unexpected conditions will enable the Resident Engineer to coordinate and plan, with design engineers, any additional investigations needed to establish design modifications.

(2) Equipment and procedures are adequate to satisfactorily accomplish the work. Review of the contractor's plans for quality control, dewatering and draining work areas, and haul roads, together with inspections of the actual operations, is an important aspect of construction control.

(3) The completed structure meets the requirements and intent of the plans and specifications. This involves continuous inspection of foundation and abutment preparation, material processing, and embankment construction, and a comprehensive control testing program to ensure proper material placement and compaction.

(4) Adequate construction records are maintained. Preparation of completion reports of construction operations and maintenance of records of test results are essential aspects of field control. Such reports and records are often required to evaluate claims by the contractor and to determine possible causes of distress that might later occur in portions of the completed work. These documents should include as many detailed photographs as necessary. Video photography may also be included in the methods to document and record construction procedure and methods.

b. Relation of construction and design. The design of an earth or rock-fill dam is not finished until construction is complete, the reservoir has been filled, and the dam is functioning satisfactorily. During construction, design engineers should frequently reassess design concepts and assumed conditions in light of actual conditions observed in the field. This involves frequent visits to the project to observe actual conditions and construction procedures. Consultation with specialists may be required to evaluate unusual problems or foundation conditions. Design evaluation must include analyses of compaction control results. It may also require reanalysis of stability conditions based on results of laboratory tests on record samples and additional foundation samples and field observations of pore water pressures, settlements, and lateral displacements. A high degree of coordination between design and construction engineers is mandatory.